

Substitution Groups

Modules Roadmap:

You Are Here

Anatomy of an XML Exchange

XML Conceptual Review

Basic XML Schema for NIEM

Advanced XML Schema for NIEM

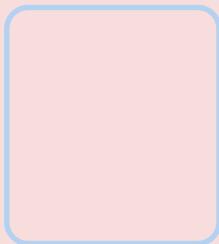


Substitution Groups

Extension Schemas

Objectives Roadmap:

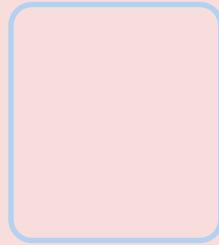
This module supports the following course objective:



Define the physical components of an XML exchange.



Identify basic XML components that are used in the NIEM structure.



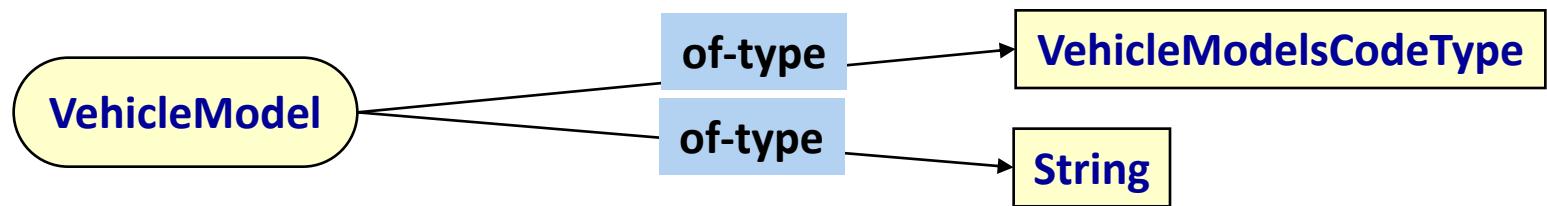
Write and/or extend an XML schema conformant to the NIEM Naming and Design Rules (NDR).

Module Objectives

- After completing this module, you should be able to:
 - ◆ Define and create explicit substitution groups.
 - ◆ Identify all possible members of a substitution group within a schema or set of sub groups.
 - ◆ Create an XML instance of a valid substitution group.

Multiple Representations

- The same element may be represented by different types depending on:
 - Domain
 - Business Needs



Substitution Groups

- Mechanism that allows elements to be substituted for other elements.
- Elements can be assigned to a group of elements that are substitutable for a particular element called the ***head element***.
- ***Head element*** does not define itself as being head element.
- **substitutionGroup** attribute used to add an element to a specific substitution group.
- ***Head elements*** are commonly defined as being abstract.

Explicit Substitution Groups

- Force substitution.
- Cannot appear in an instance document.
- A member of the abstract element's substitution group must appear in the instance document.
- Serve well as a placeholder in a reference model.

Explicit Substitution Groups Schema

```
<xsd:complexType name="VehicleType">  
    <xsd:sequence>  
        <xsd:element ref="abc:VehicleModel" />  
    </xsd:sequence>  
</xsd:complexType>  
  
<xsd:element name="VehicleModel" abstract="true" />  
  
<xsd:element name="VehicleModelText" type="xsd:string"  
substitutionGroup="abc:VehicleModel" />  
  
<xsd:element name="VehicleModelCode" type="dot:VehicleModelsCodeType"  
substitutionGroup="abc:VehicleModel"
```

Declares element as being abstract

Makes the elements substitutable for abc:VehicleModel

Explicit Substitution Groups Instance

```
<abc:Vehicle>
    <abc:VehicleModelText>Corvette</abc:VehicleModelText>
</abc:Vehicle>
```

OR

```
<abc:Vehicle>
    <abc:VehicleModelCode>CVTTE</abc:VehicleModelCode>
</abc:Vehicle>
```

Exercise 5.1: Substitution Groups

```
<complexType name="PersonType">
    <sequence>
        <element ref="PersonName" minOccurs="0" maxOccurs="unbounded"/>
        <element ref="PersonSecurityClearance" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
</complexType>

<simpleType name="SecurityClassificationLevelType">
    <restriction base="token">
        <enumeration value="Unclassified"/>
        <enumeration value="Restricted"/>
        <enumeration value="Confidential"/>
        <enumeration value="Secret" />
        <enumeration value="Would Have To Kill You If I Told You"/>
    </restriction>
</simpleType>
<element name="Person" type="PersonType"/>
<element name="PersonName" type="string"/>
<element name="PersonSecurityClearance" abstract="true"/>
<element name="PersonSecurityClearanceText" type="string"
substitutionGroup="PersonSecurityClearance"/>
<element name="PersonSecurityClearanceCode" type="SecurityClassificationLevelType"
substitutionGroup="PersonSecurityClearance"/>
```

Solution 5.1: Substitution Groups

```
<Person>
    <PersonName>Tom Carlson</PersonName>
    <PersonSecurityClearanceText>
        Classified
    </PersonSecurityClearanceText>
</Person>

<Person>
    <PersonName>Joe Mierwa</PersonName>
    <PersonSecurityClearanceCode>
        Secret
    </PersonSecurityClearanceCode>
</Person>
```

Implied Substitution Groups

- Head element either:
 - ◆ Holds actual data, or can be replaced with an element out of the Substitution Group
- Substituting element must be of:
 - ◆ The same type as the head, or
 - ◆ A type ultimately derived from the head's type

Implied Substitution Group Schema

```
<xs:complexType name="HybridVehicleType">  
  <xs:complexContent>  
    <xs:extension base="nc:VehicleType">  
      <xs:sequence>  
        <xs:element name="HybridVehicleBatteryType"  
          type="nc:TextType"/>  
      </xs:sequence>  
    </xs:extension>  
  </xs:complexContent>  
</xs:complexType>
```

Extending
nc:VehicleType

```
<xs:element name="Vehicle"  
  type="local-ns:HybridVehicleType"  
  substitutionGroup="nc:Vehicle" />
```

Create new
element

Define element as
allowable
substitution for
the extended type

Implied Substitution Group Instance Document

Substitution Group attribute explicitly allows extended HybridVehicleType to be used instead of the parent

```
<local-ns:Vehicle>
  <nc:VehicleID> WFM30EFC2981</nc:VehicleID>
  <nc:VehicleMake>Ford</nc:VehicleMake>
  <nc:VehicleModel>Escape GL</nc:VehicleModel>
  <local-ns:HybridVehicleBatteryType>
    Dylithium Crystal
  </local-ns:HybridVehicleBatteryType>
</local-ns:Vehicle>
```

Module Summary

- After completing this module, you should be able to:
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 - ◆ Create an XML instance of a valid substitution group.

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